MARINE REVIEW.

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A Novel Exhibit.

Probably the most costly and extensive exhibit in the transportation building, World's Columbian Exposition, will be that of the International Navigation Company. A section of one of the trans atlantic steamers of this company, the New York and Paris, will be built up to one of the side walls of the big building. As in the case of the battle ship built of brick on the fair grounds, visitors at the exposition can go aboard this midship section of the great Atlantic liner, which will be built full size and will include one of the immense smoke stacks. Cabins and other parts of the exhibit will appear just as they are on the boats, Extra space has been granted to the International company, and the cost of the undertaking will be quite large.

To Consider Raft Towing

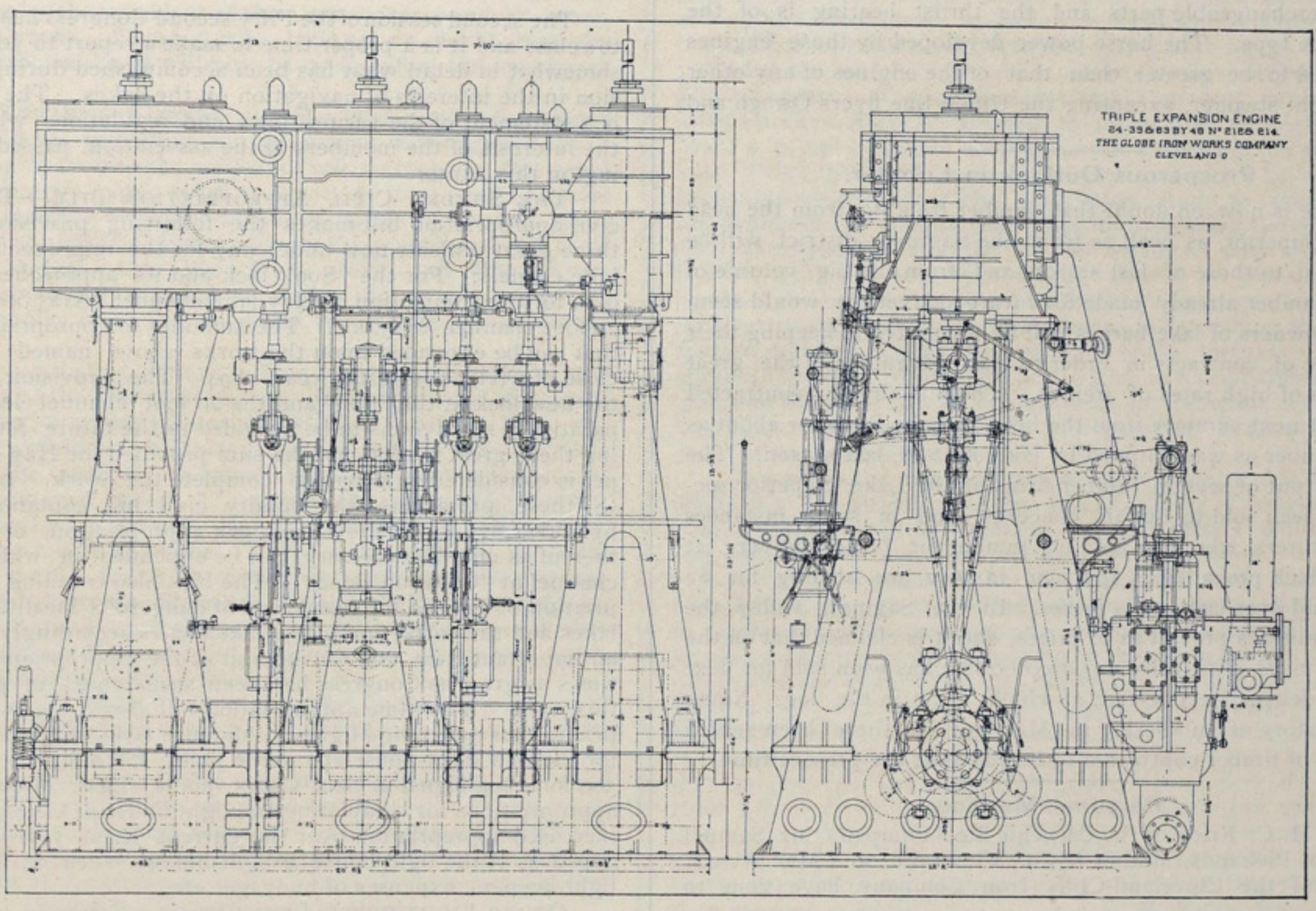
An advertisement elsewhere in this issue announces the public meeting of the board of engineer officers recently appointed by the war department to consider the question of raft towing on the lakes will be held in the office of Gen. Poe, Detroit, at 10 a. m., April 6. Views on the subject must be in writing and in duplicate.

Stocks of Grain—Available Capacity at Chicago.

Available grain capacity at Chicago is about 1,000,000 bushels, and at Milwaukee, according to a list prepared by the Evening Wisconsin, the aggregate capacity of vessels in winter quarters is 2,956,000 bushels. Not more than 500,000 of the Milwaukee capacity will be loaded at that port, so that Chicago grain shippers can still count upon 3,500,000 bushels capacity to load. The following table, prepared from reports of the Chicago board of trade, shows the stocks of wheat and corn in store at the principal points of accumulation on the lakes on March 4, 1893:

	Wheat, bu.	Corn, bu.
Chicago	14,903,000	6,568,000
Duluth	15,922,000	341 000
Milwaukee	2,027,000	14,000
Detroit	2,018,000	28,000
Toledo	3,648,000	1,600,000
Buffalo	2,522,000	73,000
Total	41,040,000	8,624,000

At the points named there is a net increase for the week of 295,000 bushels of wheat and 44,000 bushels of corn.



GLOBE TRIPLE EXPANSION ENGINES. (For description see page 6.)

Coming Back to the Lakes.

Capt. McDougall announces that the whaleback steamer Charles L. Colby and barge 110, which were built at West Superior and sent to the Atlantic coast some time ago, will be brought back to the lakes upon the opening of navigation. It will be necessary to take the boats apart in bringing them through the St. Lawrence canals. Indications of a dull season on the coast and prosperous business on the lakes are causes given for bringing the barges back to the lakes. The boats were intended for the Cuban ore trade, but it is now announced that the whalebacks for which keels will soon be laid in England will be put into that trade. Probably the lake-built barges were not altogether suited to the ocean trade. The whale-back does not seem to thrive on salt water.

Globe Triple Expansion Engines.

The engraving on the first page represents the triple expansion engines of the steamers Mariposa and Maritana. They were built by the Globe Iron Works Company, Cleveland. The cylinders are 24, 39 and 63 inches by 48 inches stroke, the intermediate being 1 inch larger, the low pressure being 2 inches larger, and all having 6 inches more stroke than is the usual practice of this company. The boats in which these engines are placed are 350 feet over all, 330 feet keel, 45 feet beam and 24½ feet deep. They are 37½ feet longer and have 6 feet more beam than boats of the same line in which smaller engines are used, the boiler power in the smaller boats consisting of two 14 by 12½ feet boilers and that in the larger boats consisting of three 12 by 12 feet boilers. The smaller engines are of 1,300 nominal horse power, and the larger ones of 1,800 horse power, but the latter indicated 2,163 horse power at 74 revolutions, the steam being at 170 pounds pressure, vacuum 22½ and hot well temperature 98 degrees. The connected air pump has a bore of 31 and stroke of 18 inches; diameter of feed pump 4 inches and stroke 18 inches. There is a piston valve on the high pressure engine and single and double ported slide valves on the intermedlate and low pressure cylinders, respectively. The crank shaft is in three interchangeable parts and the thrust bearing is of the horse shoe type. The horse power developed by these engines is believed to be greater than that of the engines of any other lake freight steamer, excepting the Union line flyers Owego and Chenung.

Prosperous Outlook in Lumber.

There is now no doubt that lumber freights from the head of Lake Superior, as well as from the Saginaw district, will be fully equal to those of last season, and from the big volume of sales of lumber already made for future delivery it would seem that the owners of lake barges will be warranted in keeping their boats free of contracts in order to take advantage of the great prospects of high rates of freight. There is already contracted to go east next summer from the head of Lake Superior about as much lumber as was shipped by lake, all told, last season. The entire output of several lumber firms of the Lake Superior section has been sold to Buffalo concerns, and in some instances manufacturers, who have sold no lumber for future delivery at prices which prevailed at any time in 1892, are holding for $2 a thousand over last year's prices. In the Saginaw valley the same conditions prevail as to prices, and it is claimed that on the Saginaw river alone fully 100,000,000 feet has been sold for next season's delivery, every foot of which is yet in the log. Never in the history of lumbering in Michigan has there been such a quantity of timber contracted to be cut as at the present time.

Personal Mention.

Mr. H. C. Frick of the Carnegie Steel Company, Mr. Samuel Mather of Pickands, Mather & Co., Cleveland. and Mr. W. G. Mather of the Cleveland-Cliffs Iron Company have gone to Europe.

Mr. Blair of Carr & Blair, Chicago, and Capt. David Vance of Milwaukee were in Cleveland Tuesday, Mr. Blair is visiting lake cities in the interest of his firm, and Capt. Vance was on his way home after a European trip.

Mr. V. K. Moore of the Star Iron Company of Detroit visited Cleveland early in the week, for the purpose of considering prospects for ore sales. The Great Western mine, which Mr. Moore represents, is closed, but the company has some ore in stock and can resume operations without great expense when the market for ore warrants such action.

E. J. Lynn, with the Vessel Owners' Towing Company, Chicago, is making a tour of lower lake ports in the interest of his company. Chicago tug companies are hustling for business next season. Capt. J. S. Dunham, who has just made the rounds of the lakes, is understood to have secured a number of contracts from vessel owners by making terms that will cause his tugs to be used and will prevent much of the annoyance of running half way down Lake Michigan in the competition for tows.

Lake Carriers' Association.

M. A. BRADLEY, President.

VICE-PRESIDENTS: James W. Millen, Detroit, Mich. — John G. Keith, Chicago, Ill.
Frank J. Firth, Erie, Pa. — W. S. Brainard, Toledo, O.
Thomas Wilson, Cleveland, O. — R. P. Fitzgerald, Milwaukee, Wis.
Peter F. Miller, Buffalo, N.Y. — Alex. McDougall, Duluth, Minn.

Charles H. Keep, Secretary, Buffalo, N.Y. Geo. P. McKay, Treasurer, Cleveland, O.
Harvey D. Goulder, Counsel, Cleveland, O.

A REVIEW OF MEASURES IN THE FIFTY-SECOND CONGRESS AFFECTING THE LAKE MARINE—INTERESTING REPORT FROM SECRETARY KEEP.

Secretary Keep has just submitted to President Wilson and the board of managers of the association, a report reviewing the work of the session of the fifty-second congress just closed, as it relates to vessel interests on the lakes. The report will be presented to the finance committee of the association at its meeting in Cleveland on Monday next. Capt. Wilson is not in the city, but Messrs. M. A. Bradley, James Corrigan and othsr members of the board of directors, realize the importance of the document, and with their permission it is here printed in full, in order that members of the association in all parts of the lakes may understand the benefits derived from the present organization of vessel interests:

The second session of the Fifty-second Congress has now come to a close and it is a proper time to make a report to you showing somewhat in detail what has been accomplished during the session in the interests of navigation on the lakes. The following is a statement of the various laws and regulations which affect the interests of the members of the association, passed at Washington this winter.

THE SUNDRY CIVIL APPROPRIATION BILL.—The sundry civil appropriation bill makes the following provision for the three great projects now under way for the improvement of the lake chanals: For the "Soo" lock and its approaches, $1,230,000; for the completion of Hay lake channel, $225,000; for the 20-foot channel, $875,000. The amounts so appropriated are all that can be expended upon the works above named up to the close of navigation in the year 1894. The provision made for the new lock at the "Soo" and the 20 foot channel leaves comparatively small sums to be provided in the future for completing these great works, and the sum provided for Hay lake channel is considered sufficient to complete the work. In addition to these provisions, the sundry civil bill contains an item by which $25,000 of the "Soo" lock appropriation, or so much thereof as may be necessary, can be expended in widening the channel at "Collision Bend." The bill also contains an appropriation of $25,000 for re-surveys of dangerous localities on the lakes and the correction of the lake charts accordingly. This is an important item, and the amount of the appropriation is five times as great as Congress has been accustomed to provide for this work. The same appropriation bill also contains an appropriation for new range lights in Maumee river of $8,000; $20,000 for the new light-house at 14-mile point, Lake Superior, and $3,300 for a fog signal at Seul Choix point, Lake Michigan; also appropriations for completing the light-house at Chicago, and an increased appreprlation over the current fiscal year for general expenses of the light-house establishment, such as salaries of light-keepers, expenses of buoyage, etc.

OTHER LIGHT-HOUSE LEGISLATION.—Congress has passed a law authorizing, but not appropriating for, the establishment of thirty-eight new light houses and fog signals on the great lakes. This law has received the approval of the president. Its importance will be seen next year when its passage will greatly aid us in securing the necessary appropriations for these lights.

THE HARTER BILL.—This important bill which passed both houses of Congress and has received the approval of the president, marks a new departure on the part of the government of the United States in making the laws relating to shipping more liberal to the vessel owners and bringing the laws of the country into harmony in this respect with the laws of other great maritime nations. Under the decisions of the supreme court of the United States, vessel owners in this country have been unable to exempt themselves from liability for loss or damage to the cargo where such loss or damage was in any way the result of fault or negligence on the part of the officers or crew of the vessel. The practical operation of this rule was as follows:

The owner of the cargo always protected himself by marine insurance. In the case of loss or damage, the insurance company, having paid the loss, became subrogated to the rights of the cargo owner against the vessel, and where fault or negligence on board the vessel could be proved, they proceeded to enforce their claims against the vessel owner. The third section of the Harter bill, which is the only section which applies to vessels in the coast-wise trade, provides that where a vessel owner has exercised bue dilligence to make his vessel seaworthy and properly to man and equip her, he shall not be liable for loss or damage to the cargo for any fault or negligence in navigation or management of the vessel, unless it be the fault or negligence of the ship's owner or manager. The law recognizes that when the owner of the vessel has done all he can do before she starts on her voyage, he has no further control over his officers and crew, and that loss or damage to the cargo resulting from their fault, negligence or errors in judgement should be left with the underwriters who have been paid to assume those risks, and that the underwriters should not be left free to take the premiums and then saddle the loss on the vessel owner.

RECIPROCITY IN WRECKING.—Senators McMillan and Sherman were induced to take an interest in this matter during the last few days of the session, and as a result a rider was attached to the ligislative appropriating bill amending the former act of Congress on this subject, by exempting the Welland canal from the proposed reciprocity. This removes the obstacle which has stood in the way of immediate proclamations of reciprocity in wrecking by the president of the United States and governer-general of Canada. There can be little or no doubt that the necessary proclamations will now be made before the opening of navigation.

RAFT TOWING.—Congress passed a joint resolution, signed by the president, providing for an official investigation by a board of engineers into the subject of raft towing on the great lakes, and directing such board to report to the next Congress as to what restrictions should be placed upon the size and manner of constructing the towing rafts on the great lakes and their connecting waters. Gen. Poe, Major Davis and Major Sears have been appointed a board to make this investigation. A thorough inquiry and a fair, impartial report is therefore an assured fact.

WELLAND CANAL TOLLS.—The controversy between the government of the United States and the government of Canada over the discriminating tolls on the Welland canal has been settled by the withdrawal, by Canada, of all tolls which discriminate unjustly against American vessels, American ports or American routes of export. Last year the grain tolls on the Welland canal were 20 cents a ton to Ogdensburgh and Oswego and 2 cents a ton to Montreal. This year the tolls are 10 cents a ton to all ports. Last year regulations also discreminated unjustly against the trans-shipments of Montreal grain at Ogdensburgh and favored trans-shipment at Kingston. Under this year's regulations Kingston and Ogdensburgh are placed upon the same footing as ports of trans-shipment.

SPEED IN NARROW CHANNELS.—The association achieved immediate and complete success in the attempt to secure new regulations limiting the rate of speed of lake veesels in the narrow waterways found in the connecting and tributary waters of the lakes. The regulations proposed by the association were adopted by the supervising inspectors at their annual meeting at Washington. On the 25th of February they were approved by the secretary of the treasury, and will have the force of the law from May 1, 1893, when they are to take effect.

No legislation in any way hostile to the interests of lake commerce has become a law during the session just closed. No bills like the Frye bill, the load-line bill or the projectile law have been introduced. The only bill which could be in any way regarded as hostile was the Harter bill in its original form, but before final passage this was so amended as to be entirely shorn of its objectional features and to be distinctly advantageous as heretofore explained. The bill for a bridge from Rice's point, Duluth, to Connor's point, Superior, did not pass either house.

This completes the record of legislation for the winter. Important advantages have been achieved with comparative ease, and it must be entirely apparent to you and to the other members of the board of managers that legislation in the interest of the lake commerce is not nearly so difficult to obtain as was the case a few years ago. With the single exception of light-house legislation we now get everything we reasonably ask. So long as the light-house board divides the aids to navigation, which it has recommended, into the three classes, "indispensable, necessary and desirable aids," it is almost impossible in the present state of the public treasury to procure appropriations for light-houses not classed as indispensable. This would not be so serious if the light-house board always classes the aids of navigation which we consider most important and urgent in the first class. As a matter of fact, however, the classification by the board has been made by the Washington officials, on short notice from the secretary of the treasury, without opportunity to consult with the district officers, and under instructions from the secretary of the treasury limiting the amount of money for each class of recommended aids. Under these circumstances, it is not strange that the board officers, with very limited knowledge of the lake waterways, should make a classification in which aids which we regard as comparatively unimportant are classed as "indispensable," and aids which are most urgently needed are classed as "desirable." It is undisputable also that the financial limitations placed upon the board by the secretary of the treasury for each class, have induced them to put items into the "indispensable" class simply because they were cheap and not because they were really indispensable.

It will probably not be possible to put an end to this classification by the light-house board. The practice of the department has become well established, and the appropriation committees of Congress have come to rely upon this classification as an aid in discriminating between rival claims for appropriations. The remedy for the present unsatisfactory conditions undoubtedly lies in closer relations between the light-house board and the association. The board should never be called upon by the secretary of the treasury to make this classification without having in its possession a complete and exhaustive report showing just what the wishes of the lake vessel owners are in this important matter. At some time during the present summer the Lake Carriers' Association ought to obtain from the light-house board a complete list of all the aids to navigation on the great lakes which the board has recommended and which have not yet been appropriated for. The association ought to arrange this list of aids in the order of their importance, giving the reason for such arrangement, and the list so arranged, with a complete brief or argument accompanying it, should be placed in the hands of the light-house board by the Lake Carriers' Association for the use and information of the board in furnishing the classification required of it by the secretary of the treasury. In my opinion the board would only be too glad to receive this information, and the cases would be few and far between where the board hereafter recommends as "indispensable" items other than those at the head of our list.

As soon as the new secretary of state assumes his duties, I shall call his attention to the recent action of congress with regard to reciprocity of wrecking, and this matter will be at an end with the issuance of the necessary proclamations.

It has been suggested that the Lake Carriers' Association should have the new regulations relating to the speed of vessels in narrow channels conspicuously printed on a card, which could be placed on each vessel belonging to the association. In view of the fact that some difficulty might arise in determining just what navigable channels are less than 500 feet in width, and to aid masters in knowing just when they must consider their vessels subject to the regulations in question, it has been suggested that the principal localities on the great lakes where these new rules will come into play should be enumerated upon such card and masters should be directed to observe the new rules in the places specially mentioned, and also "in all navigable channels on the great lakes and their tributary and connecting waters less than 500 feet in width."

C. H. KEEP, Secretary.

In General.

The Federal Reporter, issue of Feb. 28 contains in full the descision of Judge Swan. United States district court, Detroit, in the New York-Conemaugh collision case, which was heard some time ago.

Eight cases containing models of vessels built by James and George Thompson, Clyde ship builders, have just been received at Chicago for exhibition at the world's fair. The models are valued at $9,750.

Messrs. Amasa Fitch of C. W. Elphicke & Co. and J. S. Gadsden of the Aetna Insurance Company, both of Chicago, visited Cleveland and other lake ports after adjournment of the Detroit meeting of the underwriters.

An engraving showing plans for a lift bridge at South Halsted street, Chicago, which appeared in the last issue of the REVIEW, was prepared by the Railway Review of Chicago, and should have been credited to that journal.

Satisfied With Legislation—Insurance Matters.

Special Correspondence to the MARINE REVIEW.

BUFFALO, N. Y., March 9.—The late congress had its shortcomings, but it did well by the lakes. Secretary Keep, who stuck by the lake interests till the last measure was secured comes back from Washington greatly pleased, and writes a report to President Wilson of the Lake Carriers' Association that is a sort of note of triumph. He rather wonders at the good sense that cut off the demand for reciprocity in wrecking in the Welland canal, but rejoices that we are now prepared to accept the terms offered by Canada, and do our own wrecking in the waters of the dominion as soon as the necessary proclamation is made. The strength of the Lake Carriers' Association, after doing what it has in securing aid from Congress, is greater than ever. The renewals of membership are coming in rapidly, so that it is already apparent that over 600,000 tons will be represented in the association this year.

It must not be said very loud, but underwriters are apparently agreed that no advance in hull rates is to be looked for on account of the steel vessel scare. One of them said lately that there need to be no haste to place hull risks after rates are announced. Rates will be easy. The danger of the ocean agencies or foreign companies gobbling the whole business is not so great as it was, for they have mostly dropped out of sight, but this has not inspired confidence enough to warrant any high handedness in placing hull risks. Buffalo underwriters appear to be pleased over the transfer of the Lloyd's management to Chicago. When the presidency was offered them, they declined it. They remembered that Chicago has long wanted to try her hand at the helm and so they thought this would be a good year for it. There are breakers enough ahead for a lively passage.

The Union Steamboat Company is still unable to get its damage cases growing out of the Tioga explosion, brought to trial. These claims made by the members of the crew or their heirs, many of them ficticious, it is claimed, amount to over $100,000. The company tried hard to get a trial in the New York district court and then in Chicago, but has not obtained a date yet.

There is still no call for coal carriers. Vessel men have about concluded to demand 60 cents to Chicago, holding that it is not a high rate. The Reading troubles are said not to be going to make any difference with coal movements. Coxe Bros. have already begun business. They have taken the Scott dock and they are stocking coal. Last year they did not begin till the summer was half gone.

Inventions of a Marine Nature.

Specially reported from Washington for the MARINE REVIEW.

492, 496—Tackle block, by Hilary C. Johnson of Media, Pa., filed April 5, 1892; serial number, 427, 808. Two blocks are side by side, being hinged at the bottom. Each block is provided with a hook at the bottom, the hooks closing upon each other when the blocks lie close together, but a spring tends to keep them apart until the strain closes them. A hook is also mounted at the block eyes, by which they may be fastened together at will.

492,439—Chain and the manufacture thereof, by Alfred Shedlock of Jersey City, N. J.; filed June 7, 1892; serial number, 435, 913. The links are stamped from a sheet of metal, and in such manner that one edge is straight, but the other re-entrant, so that the adjoining ends of one series of links lay by and fit the re-entrant part of the links in the other series, and vice versa. After the links are cut, the distorted edge is bent to the desirable shape.

492.550—Hoisting block, by Thomas R. Farrall of Bridgeport, Conn.; filed Sept. 7, 1892; serial number, 445,285.

492,687—Device for locking and operating dredging spuds. by Frank H. and Geo. W. King of Marion, O.; filed Apr. 23, 1892; serial number, 430,388.

492,688—Trunk and life preserver, by Paul Krenkel of Leipsic, Germany; filed May 18, 1892: serial number, 433,485.

492,704—Levee and dam structure, by Geo. P. Anderton of Concession, La.; filed August 6, 1892; serial number, 442,375.

Copies of patents can be had from the Marine Review, No. 516 Perry-Payne building, Cleveland, O., at the uniform rate of 15 cents each.

Endorsement for a Record of Integrity.

Special Correspondence to the MARINE REVIEW.

WEST BAY CITY, Mich., March 9.—The banquet given to his friends by F. W. Wheeler last Thursday night was probably the happiest expression of pleasure and good feeling from a successful ship builder ever experienced on the lakes. The toast master remarked that when a man got to be about forty years old and had built one hundred boats it was time that he should call in his friends and share his prosperity with them; and if providing a royal feast fulfills that obligation, Mr. Wheeler certainly did it. Owners of a number of large fleets of lake vessels were present, and all of them who had vessels built at the Saginaw valley yard acquiesced with hearty applause when the statement was made that an owner always got all that he contracted for at the Wheeler yard, and in most cases a better boat than his specifications called for. One gentleman present had purchased the twelfth, the sixty-third and the eighty-eighth boat built by Wheeler & Co., which was a good evidence of satisfactory work. The governor of Michigan, the wealthiest men of the Saginaw valley, some of the most successful vessel owners and business friends, aggregating 170, were present. Those who had not visited the yard before were surprised at the extent of it and the capability of the modern improvements throughout the plant. The newly added engine building plant, with machinery of the latest pattern, and the labor saving machinery in the ship yard were features that received special comment of a favorable nature.

Several thousand people were present at the keel laying of the Centurion, the one-hundredth boat to be built at the Wheeler yard. About 200 feet of the keel was laid with the traveling crane, the work being superintended by Mr. Wheeler.

Appointments of Masters and Engineers.

Republic Iron Co., Cleveland, O: Steamers—Republic, Capt. J. A. Landfair, Engineer Wm. Lowe; Specular, Capt. E. T. Rattray, Engineer A. E. Bury; Continental, Capt. Chas. Hinslea, Engineer Geo. W. Sweet. Schooners—Magnetic, Capt. W. M. Garvey; Grace Holland, Capt. Henry Rogers.

Hawgood & Avery Transit Co., Cleveland, O: Steamers—New boat, (Wheeler's No. 94), Capt. E. B. McQueen, Engineer James Balfour; Geo. F. Williams, Capt. George Robarge, Engineer P. J. Navaugh; Servia, Capt. Thos. Ellis, Engineer Richard McLaughlin; W. A. Avery, Capt. Christian Smith, Engineer Thos. Abernithy; Morley, Capt. James Sanford, Engineer, Dan McMillan; Belle Cross, Capt. John O'Connors, Engineer O'Brien. Schooners—H. A. Hawgood, Capt. Fred Ahlstrom; Moravia, Capt. Louis Bang; F. D. Ewen, Capt. Wm. Angell. Barges—Chicago Board of Trade, Capt. Patrick Gordon; Clement, Capt. James Jean; Geo. H. Waud, Capt. Allison Trudo.

Lake Superior Iron Company, Cleveland, O: Steamers—Wawatam, Capt. Ed. Mooney, Engineer, Edward Dempsey; Griffin, Capt. Orville W. Green, Engineer, Henry Schoof; LaSalle, Capt. Henry W. Stone, Engineer, Warren G. Tilton, Joliet, Capt. P. L. Millen, Engineer Owen Williams; Choctaw, Capt. W. W. Brown, Engineer, Chas. Gumlick; Andaste, Capt. ——, Engineer, F. B. Smith.

Brown Transportation Company, Cleveland, O: Steamer—Castalia, Capt. C. C. Allen, Engineer, James Hay.

Mitchell & Co., Cleveland, O.: Steamers—Wm. H. Grativeck, Capt. M. P. Parsons, Engineer Edward Guy; Wm. F. Sauber, Capt. Chas. B. Galton, Engineer C. J. Love; R. L. Fryer, Capt. Christian Peterson, Engineer Wm. Fetting; John Mitchell, Capt. W. H. Cowin, Engineer Nelson Goulette; Wm. H. Gratwick, Capt. Richard Jackson, Engineer Frank Parker; Ed Smith No. 2, Capt. David Carrier, Engineer Henry Graves; Wocoken, Capt. Albert Meswald, Engineer Frank Cadotte; Ed Smith No. 1, Capt. B. D. Townsend, Engineer Peter Savely; Geo. T. Hope, Capt. N. V. Nelson, Engineer George L. Brackett. Barges—John C. Fitzpatrick, Capt, K. A. Jensen; L. E. Marvin, Capt. Wm. Brines; R. L. Fryer, Capt. Eli Jacques; C. J. Fillmore, Capt. N. C. Kendall; Angus Smith, Capt. L. P. Smith; Maria Martin, Capt. Wm. Rouvel; Troy, Capt. Jefferson Williams; Camden, Capt. Master J. S. Van Renslaer; Joseph Paige, Master A. E. Bullock.

Cleveland Cliffs Iron Company, Cleveland, Ohio: Pontiac, Capt. J. B. Lowe, Engineer, T. B. Kelley; Frontenac, Capt. S. N. Murphy, Engineer P. W. Whelan; Kaliyuga, Capt. John Lowe, Engneer James Patterson; Pioneer, Capt. Albert E. White, Engineer Geo. Gourlay; Cadillac, Capt. Wesley C. Brown, Engineer Eli V. Barrey. Schooner—Fontana, Capt. Henry Harris.

Shores Lumber Company, Chicago, Ill: Steamers—D. W. Powers, Capt. Louis Guthrie; J. H. Prentice, Capt. J. J. Carr. Schooners—Halsted, Capt. Thomas Gunio; Middlesex, Capt. Paul Weimer.

Northern Michigan Transportation Company, Chicago, Ill.: Steamers—City of Charlevoix, Capt. Wm. Finucan, Engineer John Durr; Lawrence, Capt. James Boyd, Engineer Frank Bowen.

Northwestern Transportation Company, Detroit, Mich.: Steamers—S. R. Kirby, Capt. Jas. Fraser, Engineer Wm. Watt; E. M. Peck, Capt. Cal. Chamberlain, Engineer J. H. Foster; Fayette Brown, Capt. David Girardin, Engineer Nic. Nelson; new boat building at Detroit, Capt. E. C. Gatfield, Engineer John Hand.

Roby Transportation Company, Detroit, Mich.: Steamer—Geo. W. Roby, Capt. John Duddleson, Engineer Jerry Collins.

Parker & Millen, Detroit, Mich.: Steamers—Iron King, Capt. W. F. Miller, Engineer Charles Rice; Iron Chief, Capt. S. I. Millen, Engineer Geo. Lawrence; Iron Age, Capt. W. A. Irvine, Engineer John Heguner; Iron Duke, Capt. Norman L. Miner, Engineer Jacob Zeh; A. A. Parker, Capt. John T. Hutton, Engineer Joseph McKittrick; John Oades, Capt. T. Lemay, Engineer James Falconer; Minneapolis, Capt. H. W. Bogart, Engineer H. Mahoney. Schooners—Iron State, Capt. W. W. Carter; Iron Queen, Capt. Louis Leonard; Iron City, Capt. A. J. McMahon; Iron Cliff, Capt. Thomas Fitzsimmons; B. W. Parker, Capt. Edward Lohr; Red Wing, Capt. John Anderson; San Diego, Capt. Henry Morey.

Lakewood Transportation Company, Cleveland, O.: Steamers—V. H. Ketchum, Capt. W. S. Mack, Engineer William Young; C. J. Kershaw, Capt. John Ward, Engineer Michael Heinkleman. Schooners—W. H. Becker, Capt. John Maekie; Moonlight, Capt. Wm. Connors; Ironton, Capt. James Anderson; Pelican, Capt. B. Gray.

Marine Engine Design.

(Continued from vol. 6, No. 23.)

After having settled on the general character and dimensions of the engine, we may note the various considerations bearing on the arrangement of cylinders. The usual arrangement is three cranks with the high, intermediate and low cylinders in order from forward aft, the three cranks being at 120 degrees angular interval, and rotating in the same order, high leading, then intermediate and low. The advantages of equal over unequal angular intervals are: First, a greater degree of uniformity in resultant crank effort, and a consequent increase in the smoothness of working of the engine; second, the possibility of a crank shaft built with interchangeable segments.

The advantage of placing the cranks in the angular order high, intermediate, low, rather than high, low, intermediate, depends on the details of the distribution of the steam among the cylinders, a comprehensive examination of which is not possible at this time. It is usually considered, however, that the distribution obtained by the former arrangement is rather more desirable than that obtained by the latter. The advantage in placing the cylinders in the order high, intermediate, low, from forward aft, is chiefly to bring the high on the forward end near the boilers, thus rendering matters of steam piping somewhat simpler than with other arrangements.

There are various other arrangements possible with the three cylinders of a triple expansion engine. We may, for example, have the high on top of the intermediate, both acting on the same crank, the low acting on the other crank, the angle between the the two cranks being either 90 degrees or 180 degrees. The advantages are: First, shorter length required in the engine room; second, slightly less work required on the engine, due to a saving of one crank, connecting rod, fittings and frame; third, with the cranks at 180 degrees, the movements of the two masses attached to them being in opposite directions, there will arise a partial counterbalance of inertia effects, and a consequent decrease in one of the principal causes of vibration in the ship. By paying special attention to the adjustment of the weights, a very fair, though by no means perfect balance may be obtained. Without going into a detailed investigation of the subject, it may be in order to point out here the importance of reducing, as far as possible, the causes of vibration. The prejudical effects are primarily two in number—a tendency towards a gradual disintegration of the ship and loss of power. The first effect is quite evident; the second no less certainly exists, and may be of very considerable importance. It arises in two ways—from the actual power required to maintain the vibration, and from the increase of engine friction which results from the vibration and yielding of the hull. A moment's thought will suffice to show that a certain amount of power must be required to maintain the vibration of a ship, and in cases of extreme degree, this power will be of no inconsiderable amount. Such power can come from but one source, viz., the coal bunker; and the coal thus burnt to maintain the vibration is not only wasted so far as propulsive effect is concerned, but in addition the energy developed from it is used to gradually shake the ship to pieces. So far, therefore, as the arrangement of cranks at 180 degrees tends towards the diminution of the causes of vibration, so far is the advantage gained a valuable one.

As a further advantage, we may note the small receiver volumes which are appropriate to this arrangement of cranks. To offset these various advantages, certain disadvantages must be noted. First, both cranks being on the dead point together, the engine is more liable to catch on the center than with cranks at some other angle. To obviate this the angle is sometimes made 170 degrees or 190 degrees, thus retaining the small receiver volumes, the possibility of obtaining very nearly a balance of inertia effects, and lessening the likelihood of catching on the center. Second, the crank effort is less uniform than with three cranks at equal angles, or with two cranks at right angles. The result of this is that the wider the variation in crank effort, the larger must the shaft be made to safely transmit the same mean crank effort, and the greater also will be the tendency to produce vibration of the ship, so far as vibrations are due to irregular motion of the propeller. Vibration effects, however, are chiefly due to the inertia of the moving parts of the engine, so that so far as this consideration alone is concerned, the two cranks at 180 degrees are preferable. From the standpoint of uniformity of crank effort, however, they are the least desirable, next in order being two cranks at 90 degrees, and better than either, three cranks at 120 degrees. Third, the power developed in three cylinders being taken by two cranks, there arises a very considerable difference between the two parts of the engine, as to the stresses to which the cranks, engine frames, bed plate, etc., are subject. Fourth, the superposition of one cylinder upon another results in an increased height of engine, thereby raising its center of gravity, and perhaps entailing other undesirable results.

If the high or intermediate cylinder were placed over the low, and the intermediate or high were placed alone, the same general advantages and disadvantages would be present, but in modified degree, the former being on the whole decreased and the latter increased.

We may also arrange a triple expansion engine with four or more cylinders. With four we may have one high, one intermediate and two low, one high, two intermediate and one low, or two high, one intermediate and one low. This admits of a large variety of arrangements of cylinders and cranks. The latter may be either two, three or four in number, and the cylinders may be arranged in a variety of ways too numerous and unimportant to justify detailed examination. The usual arrangement with four cylinders is with four cranks, the cylinders being placed in order from forward, high, intermediate, low, low, the cranks being at 90 degrees. The chief advantages of such an arrangement are: First, a very fair degree of uniformity of crank effort, with the possibility of a good counterbalance of inertia effects; second, a decrease in the diameter of the low cylinders, and a consequent decrease in the width of the engine. When, therefore, it is desirable to render the transverse dimensions of the engine as small as possible, or if the diameter of a single low cylinder would, for any reason, be unduly large, such an arrangement may be adopted.

Various other arrangements are possible, involving five or six cylinders, and from two cranks upward. Such cases, however, would only naturally arise in the problem of changing an existing compound engine into a triple expansion without change in the number of cranks. The two-crank arrangement noted above would obviously answer such requirements for a two-crank compound, or with four cylinders, we might place a high over both the intermediate and low. In such case the power is more evenly divided between the two cranks than with three cylinders, the high being over the intermediate alone.

The whole question of the arrangement of cylinders and cranks is inseparably bound up with the other quantities entering into the design, and no general statement can be made as to the absolute advantage or superiority of any one arrangement over another. The number of quantities which may enter as factors into the design of a triple expansion engine is from twenty to thirty, a variation in any one of which will affect more or less its performance. Unquestionably there is some one combination of these various quantities which will be absolutely the best for any one set of conditions, or for any given range of conditions, but just exactly what such combination is, no one is able to certainly state. While, therefore, various single arguments may be cited for this or that arrangement, it is only in the light of the whole subject that the question should be decided. The general experience of the last ten years seems to point to three cylinders with three cranks at equal angles, as mentioned above, as the most nearly fulfilling the average conditions, and we may accept such verdict as indicating the propriety of such form of design unless special reasons can be cited for departures from it.

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*Written for the MARINE REVIEW. by W. F. Durand, principal of graduate school of marine engineering and naval architecture, Sibley College, Cornell University.

MARINE REVIEW.

DEVOTED TO THE LAKE MARINE AND KINDRED INTERESTS.

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The books of the United States treasury department contain the names of 3,600 vessels, measuring 1,154,870.38 tons in the lake trade. In classification of this fleet the lakes have more steamboats of 1,000 to 2,500 tons than the combined ownership of this class of vessels in all other sections of the country. The number of vessels of 1,000 to 2,500 tons on the lakes on June 30, 1891, was 310 and their aggregate gross tonnage 512,787.58; in all other parts of the country the number of this class of vessels was, on the same date, 213 and their gross tonnage 319,750.84. The classification of the entire lake fleet is as follows:

Class.	Number.	Tonnage.
Steam vessels	1,592	756,751.53
Sailing vessels	1,243	325,131.06
Canal boats	703	72,515.42
Barges	62	20,472.37
Total	3,600	1,154,870.38

Tonnage built on the lakes during the past five years, according to the reports of the United States commissioner of navigation, is as follows:

	No. of boats.	Net Tonnage.
1887	152	56,488.32
1888	222	101,102.87
1889	225	107,080.30
1890	218	108,515.00
1891	204	111,856.45
Total	1,021	485,042.94

St. Mary's Falls and Suez canal traffic: Number of boats through St. Mary's Falls canal in 1890, 228 days of navigation, 10,557; tonnage, net registered, 8,454,435. Number of boats through Suez canal during 1890, full year, 3,389; tonnage, net registered, 6,890,014. Number of boats through St. Mary's Falls canal in 1891, 225 days of navigation, 10,191; tonnage, net registered, 8,400,685. Number of boats through Suez canal during 1891, full year, 4,207; tonnage, net registered, 8,698,777. Number of boats through St. Mary's Falls canal in 1892, 233 days of navigation, 12,580; tonnage, net registered, 10,647,203. Number of boats through Suez canal during 1892, full year, 3,559; tonnage, net registered, 7,712,028.

Entered at Cleveland Post Office as Second-class Mail Matter.

IF there was an elevator at Kingston, Ont., grain brought down from Chicago, Duluth and other American ports on the upper lakes could be stored and later transshipped to Ogdensburg, Oswego or some other point on the American side for New England and eastern markets. Such shipments in Canadian vessels would not be in violation of the coasting laws of the United States, as in the first instance the grain would be taken from an American to a Canadian port, and in the second from a Canadian to an American port. By being enabled to transship some grain through American ports below Lake Ontario, a market could be found for it in New England as well as in Great Britain through the Montreal route. By the late action of the two governments leading to equal canal tolls, Ogdensburg shippers now have a little advantage of the Canadians in being able to sell in New England. This is one reason why the Canadian Marine Association has asked the dominion government to grant a site for an elevator at Kingston. It is doubtful whether money can be secured for the building of an elevator if the grant of land is made, but the subject is nevertheless being very thoroughly agitated in Kingston.

IN anothor part of this issue there is printed a report from Seeretary Charles H. Keep of the Lake Carriers' Association, covering the results of the efforts of the association in the last session of the Fifty-second Congress. It is a grand illustration of the success of organization among the vessel interests and it is a tribute to Mr. Keep's personal ability. We have seen times when Mr Keep's work might be criticized on the ground that he is sometimes too easily conciliated in matters of a legislative nature, but it is due him to say frankly, with a large number of influential members of of the association, that he has secured, through practical advancement, a very thorough knowledge of the needs of lake shipping, and has acquired recognition in Washington in a way that makes him a most valuable man to vessel owners.

CITIZENS of Ashtabula who have the best interests of the town in view and are not prompted by selfish causes in the ownership of land far up the river, should take into account the great benefits derived by the town in the building up of an immense ore handling business, when considering the attempt to force the Lake Shore Railway Company to build a swing bridge for its train service. It is a narrow-minded policy that attacks a railway company that has done as much for a progressive town as the Lake Shore has done for Ashtabula. Practically its entire coal and ore interests are centered there. It will, anyhow, be found in the end that by the river and harbor act of 1890 the general government, and not the town, is in charge of the navigable stream in question in this case.

Now it is announced that President Cleveland will appoint Judge James G. Jenkins of the United States district court, Milwaukee, to the position on the circuit bench made vacant by Judge Gresham being taken into the cabinet. Judge Jenkins has had considerable experience with admiralty cases during the several years in which he has occupied the district court bench in Milwaukee.

Ore Sales Market—Lake Freights.

In response to an invitation from the Carnegie Steel Company, sent out from Pittsburg on Friday last, all of the sales agents representing Lake Superior iron mines have had representatives in Pittsburg during the past week, or have made proposals in writing relative to prices of ore for next season's delivery, but nothing has come of the negotiations, and it is now, more than ever, probable that nothing can be done in the way of ore sales before April 1, at the earliest. The result of the Pittsburg meeting of the two interests is however, favorable to the ore dealers, inasmuch as it has shown a determination on the part of the ore men to insist that sales must be on the basis of $4 for the standard Gogebics, a price which the furnace men have tried to reduce. It is well known that the Illinois Steel Company and the Carnegie Steel Company are purchasers each year of about 3,000,000 tons, or nearly one-half of the ordinary output from Lake Superior, and now as in past years all other pig iron manufacturers await the action of these companies in fixing prices. The consultation at Pittsburg this week was not the first move made in the matter of sales. A short time ago, both of the big steel companies asked the owners of the large mines for prices, and upon a proposition of $4 for the standard ores being submitted, refused to pay that figure on the claim that the outlook in the market for iron would not warrant it. The ore dealers refused to recede from their proposition, urging mainly the importance of the question of high lake freights, which seemed certain then as at the present time. It was accordingly understood that negotiations would be delayed for a few weeks, and Mr. Morse, the leading spirit in the Illinois Steel Company, left for California. Mr. Frick of the Carnegie Steel Company has gone to Europe, but strange to say, the conference of the present week with his company was arranged on the eve of his departure. Nothing has resulted from it, however, the ore sales agents returning from Pittsburg with the same opinions which they entertained on leaving Cleveland.

How much if any of this reduction of 50 cents a ton on last season's first sales will be taken out of the lake freight, in event of the ore dealers securing their price of $4, is still a question. That an effort will be made to reduce last season's contract rates there is no doubt, but most of the ore dealers are honestly of the opinion that vessels will be held for going rates if an attempt is made to establish rates below $1.20 from Ashland, a figure at which they claim tonnage can be had. Coal shippers are offering 50 cents to the head of Lake Superior on contracts, but nothing has been done, as they are not yet ready to close up any business.

Iron Mining.

VALUE OF LEADING STOCKS.

Quoted by Chas. H. Potter & Co., No. 104 Superior St. Cleveland, O.

Stocks.	Par Value.	Bid.	Asked.
Cleveland-Cliffs Iron Company.....	$100 00	$ 52 50	$.....
Champion Iron Company.....	25 00	25 00	35 00
Chandler Iron Company.....	25 00	40 00	41 00
Jackson Iron Company.....	25 00	.....	75 00
Lake Superior Iron Company.....	25 00	27 00	.....
Minnesota Iron Company.....	100 00	65 00	66 00
Pittsburgh & Lake Angeline Iron Co.....	25 00	.....	140 00
Republic Iron Company.....	25 00	.....	10 25
Ashland	25 00	.....	.....
Section Thirty-three.....	25 00	1 00	.....
Brotherton.....	25 00	.....	.....
Iron Belt.....	25 00	.....	2 50
Aurora.....	25 00	6 50	7 00

The announcement that the Mesabi Mountain Iron Company and the New England Iron Company, both Masabi range corporations holding land in fee, have declared dividends was something of a surprise in iron circles. The Mesaba Mountain will pay $4.50 a share on the 20th inst., but a dividend of $2 a share from the New England is not payable until after the close of the season of navigation. This sharing of profit, of course, comes from advance royalties, and it is looked upon as a bid for higher prices on the stock. Although the market for iron stocks generally is no better than it has been for some time past, there is a demand for shares in some of the standard companies. Contrary to an absolute lifeless condition of the market for several weeks past, there is now some inquiry for a few stocks. A short time ago one or two sales of Lake Superior were made at $25, and at that figure it is understood that there was an eastern offer for a very big block of the stock, but owners of large quantities of it refused to sell below $35. It is needless to say, of course, that Lake Superior could not be bought at present at $25. Delay with a dividend is probably due largely to the fact that this company has considerable money tied up in ore. Some demand for shares in the Iron Belt company has caused a stronger feeling regarding the stock. When Capt. Samuel Mitchell of Negaunee and his associates in Section Thirty-three announced several days ago that they had an opportunity to dispose of a control of the stock in the company at $1 a share and to the surprise of some stock holders, advised the sale of the property on that basis, it was not generally known who the prospective purchasers were. The mine goes to the Montreal company, and the argument for selling at such a low figure is based on the advantages held by the Montreal on its property adjoining Section Thirty-three. It is claimed that if the Section Thirty three mine should be sunk to a lower depth and ore found it would be necessary to take the water of the Montreal, while the latter company, which is already working deep shafts, can mine any ore that can be found in Section Thirty-three by continuing its present workings.

The new hoisting plant at the Minnesota mine hoists at the rate of 800 feet a minute, which is greater speed than is usually obtained in incline shafts. Each drum, of which there are four, has a capacity for hoisting 12,000 pounds from a maximum depth of 1,700 feet. This is the largest hoisting plant in the Lake Superior district, except the one at the Calumet and Hecla copper mines.—Vermillion Iron Journal.

In no department of the electrical field is more rapid and satisfactory progress being made than in the application of this agency to the many and varied details of mining operations. Mishaps which occur, especially in cold weather, in a mine operated by steam-power find no parellel in the electrically operated mine.

Joseph Austrian, secretary of the Mastodon Iron Company, gives notice that the annual meeting of the company will be held in Chicago on the 12th inst.

It is now said that the ore docks at Huron bay, Lake Superior, which contain 112 pockets, will be completed in a few days.

Around the Lakes.

Capt. James Reid, the well known wrecker, says he will commence work in the spring on the schooner Golden Fleece, ashore for three years off Dunkirk. She is in good shape.

Contaluta is the name of a steam vessel of Detroit to which an official number, 126,945, was assigned by the bureau of navigation last week. The boat's tonnage is 38.85 tons gross and 19.43 net.

Capt. Andrew Riersen, who was connected with the lake business for a number of years and was at one time superintendent of the Vessel Owners' Towing Company of Chicago, died in that city last week.

The steamer H. D. Coffinberry, which was tied up at Cleveland a few days ago on a claim of $8,462.28 for repairs, held by the Detroit Dry Dock Company, will very probably be sold by the United States marshal.

April 21 was the date on which the first coal laden steamers reached the head of Lake Superior last season, but there was not a free movement of vessels until after the first of May. The first vessel passed through the straits of Mackinac on April 10.

During the coming season the steel steamer W. H. Gilbert will be run between Buffalo and Duluth in the line of the Western Transit Company with the Arabia, Montana, Vanderbilt, Idaho, Badger State and Empire State, and the steamers Geo. H. Dyer and F. & P. M. No. 5 of Milwaukee will run between Gladstone and Buffalo in connection with the Minneapolis, St. Paul & Sault Ste. Marie Railway.

Rumor has it that the Frontier Iron Works of Detroit will be removed to Superior and that leading stockholders in the Wickes Boiler Works of Saginaw will join with the American Steel Barge Company in building a modern plant for the construction of boilers at the head of the lakes. Wickes Bros. and the Frontier works have both been doing a great deal of work for the barge company in the building of boilers and machinery for whaleback steamers, but this announcement is not official.

Coal docks to be erected by the North-western Fuel Company on Allouez bay, head of Lake Superior, will be the largest in the world. They will have a water frontage, or length, of 3,160 feet and will be 958 feet wide. The equipment will be modern in every way, It is claimed that on the completion of the big dock, the four docks now operated by the North-western company at the head of Lake Superior will be abandoned This company handles fully 60 per cent of all coal shipped to Duluth and Superior.

Sales of vessel property: Schooner F. W. Gifford, J. C. Van Scoter and Levi Davis to C. W. Elphicke and others of Chicago, $10,250; steamer W. J. Carter, Pardee, Cook & Co. of Chicago, and Capt. W. J. Carter of Milwaukee to Dunbar Bros. of Ludington $17,000; tug Newell A. Avery, Newell A. Avery of Muskegon to Mrs. Annie Partridge of Charlevoix, $1,200; steamer Erie L. Hackley, Seth Lee of Muskegon to Capt. Peter Campbell and others of Montague, Mich., $5,000; steamer A. L Hopkins, Capt. M. J. Galvin of Buffalo to J. Root and others of Tecumseh, Mich., private terms.

Robert Holland, whose death is announced from Marine City, was prominent in the wooden ship building industry. He built the Trader, the first steambarge on the lakes, or more strictly speaking, the first steam vessel with engines aft and a clear deck for freight. He was sixty-two years of age and had been a resident of Marine City since 1857. Among the vessels launched from his Marine City yard are the Trader, Robert Holland, R. J. Gordon, James P Donaldson, J. W. Westcott, P. J. Ralph, Porter Chamberlin, Nellie Gardner and Keepsake.

The Ketchum Lumber Company of Chicago and other purchasers of a steamer now under construction at the Davidson yard, West Bay City, have incorporated their interests under the name of the Ketchum Transportation Company, with a capital stock of $150,000 and headquarters at Chicago. Officers of the company are: President, W. P. Ketchum of Chicago; vice president, W. E. Cartier of Ludington; secretary, James A. Calbick of Chicago; treasurer, F. P. Ketchum of Chicago; manager, Capt. W. J. Carter of Milwaukee. The new steamer will be named W. P. Ketchum. The intention is to have built for her a consort barge of equal carrying capacity.

Mr. M. A. Bradley of Cleveland has returned from Hot Springs.

Locations for Pig Iron Production.

In the March number of the Engineering Magazine, John Birkinbine, president of the American Institute of Mining Engineers, has a very interesting article on "Locations for Pig Iron Production." He holds that the influence of location upon the industry is based not only upon the possibility of assembling the raw materials, but also upon the opportunities for marketing the product advantageously. "A blast furnace may act temporarily as a sign board for a real estate boom," says Mr. Birkinbine, although its operations may be a financial loss, but ultimately dividends or profit must come from it, or failure will be written against it. It is probable that the majority of persons suppose the great steel works at Chicago, Pittsburg, Baltimore, Harrisburg, Johnstown, Scranton, Bethlehem, Troy, etc.; to have been located on account of blast furnaces connected with them. It is undoubtedly true that some of these plants owe their existence to an original forge or blast furnace, but an investigation will show that, properly speaking, the existing blast furnaces were located at these points because of the steel works, and are established so as to supply to large industrial plants the raw material upon which they must depend."

Speaking incidentally of causes of progress in the Lake Superior iron ore region, Mr. Birkinbine says: "The development of the Lake Superior region, which up to the close of 1892 contributed more than 73,000,000 gross tons of iron ore, is not alone due to the high percentage of iron representing the average of the ore produced, for the variety and composition of the ores which have been mined, and which fit them for different purposes, have had a marked influence in this development. In view of the generally-accepted belief in the prime necessity of ores of Bessemer grade, it may sound peculiar to assert that, had all of the iron ores won from the Lake Superior district been sufficiently low in phosphorus to be acceptable for the production of pig iron for the Bessemer process, the development of this district would have been less rapid than it has been as a producer of the various grades of iron ore. To emphasize this fact, it is unnecessary to go further back in history than a few years, for, if an interval of five years, ending Dec. 31, 1891, be taken, and the proportionate amounts of Bessemer and other kinds of pig iron produced are tabulated, such statement shows that in the year 1887 44.81 per cent. of the total pig iron output of the country was of the Bessemer quality. In 1888 this percentage was reduced to 40.65 per cent., the total output of pig iron being practically the same as in 1887. In 1889 there was an increase of more than 1,000,000 gross tons in the annual production of the country, and in that year the quantity of Bessemer pig iron made was 41.45 per cent. of the total. Another increase of more than 1,500,000 tons brought the pig iron made in the United States in 1890 to a total of 9,202,703 gross tons, of which 44.47 per cent. was of Bessemer quality. The year 1891 showed a decline from the production of 1890 of nearly 1,000,000 tons, and in that year 41.94 per cent. of the total was of Bessemer grade. The figures which have just been compiled for the year 1892 indicate that out of the total production of pig iron 9,157,000 gross tons, 48.53 per cent. was of Bessemer quality."

Why an Injector Works.

Commenting upon an article on the injector, which recently appeared in the Stationary Engineer, Mr. R. E. Douglas, writing to that journal, says: "It is made very clear that a simple jet of high pressure steam issuing from a boiler conld never drive back a jet of water issuing from the same source, on account of action and reaction being equal, although opposite in direction; but the velocity of the issuing jet of steam is so many times greater than that of a jet of water forced outward by the same pressure. If, therefore, a jet of steam could be condensed by an unfailing source of cold after the steam was fairly clear of the orifice it would be condensed into a fine liquid line and the velocity with which its molecules were traveling would not be changed. The motion of heat would be diminished, but the onward motion would remain unimpaired. This liquid line would be moved at such a high velocity that it would pierce any jet of water coming toward it from the boiler. I wish to remark that the weight of the water, together with its velocity, has a great deal to do with the working of the injector, because the total actual energy is proportional to its weight multiplied by the square of its velocity. The working of an injector is an old story to engineers, but the reason why it works is not so clearly understood and points tending to make the principles more clear and easily understood will be an addition to our knowledge of steam operated machinery."

Wire Shafts.

In a communication published in a recent issue of the Scientific American, Mr Samuel P. Jerome of New York comments on some experiments recently made in substituting an elastic shaft constructed of steel wires for the solid steel shaft of the steamship. He says rigid shafts are broken, mainly because it is not possible to maintain exact and true lines of shaft bearings in ships of great length, and frequently because of flaws in the metal itself. The strain upon the shaft in rough weather causes a crystalization in the metal of the shaft which destroys its vitality. In the wire shaft, the wires are of small diameter, bound firmly together so as to secure strength and at the same time elasticity, both torsional and transverse. In the experiments referred to the shaft was supposed to be made in five sections, with a total length of 100 feet, and a diameter of 15 inches. It contained 25,000 No. 7 steel wires with 50,000 fastenings. The wires of each section were welded together at their ends, making a solid mass of steel upon which couplings are fixed for bolting the several sections together. The spaces between the couplings are inclosed in short metal bands holding the wires of each section in cylindrical form, and permitting, at the same time, a transverse elastic movement when the ship bends, also a torsional elasticity when a powerful wave strikes the propeller wheel. Mr. Jerome further claims for this shaft, that if built with reasonable care and skill it can not be broken in any emergency or under the severest conditions.

A British steamer, the Castlemoors, sailed from Baltimore for Havanna recently with 4,201 tons of coal in cargo and 363 tons in bunkers. The Maritime Register says this is the largest cargo of coal ever shipped from the United States for a foreign port. Half a dozen vessels coming into commission on the lakes next season will add a few hundred tons to this cargo record, but the coal will not be carried to a foreign port.

A PUBLIC MEETING OF THE BOARD OF Engineer Officers designated by Special Orders No. 7, Headquarters Corps of Engineers, in accordance with joint resolution of Congress, approved February 3, 1893, directing the Secretary of War to investigate the subject of raft towing on the great lakes and their connecting waters, will be held at the U. S. Engineer Office, 34 West Congress street, Detroit, Mich., at 10 a. m., April 6, 1893. All persons interested are invited to present their views in regard to the matter in writing, in duplicate, either in person or by mail. 9-16-23-30

PROPOSALS FOR DREDGING. U. S. ENgineer Office, Hickox Building, 185 Euclid Ave., Cleveland Ohio, February 26, 1893. Sealed proposals for dredging in harbors at Cleveland, Fairport and Ashtabula, Ohio, will be received at this office until 2 o'clock p m., standard time, of Tuesday, March 28, 1893, and then publicly opened Specifications, blank forms, and all available information will be furnished on application to this office. JARED A, SMITH, Lieut. Col. Corps of Engineers, U. S. A. 9-16-23

UNITED STATES ENGINEER OFFICE, Hickox Building, 185 Euclid Avenue, Cleveland, Ohio, February 26th, 1893. Sealed proposals for extension of piers, improving harbor at Huron, Ohio, will be received at this office until 2 o'clock, P. M., standard time, of Tuesday, March 28, 1893, and then publicly opened. Specifications, blank forms, and all available information will be furnished on application to this office. JARED A. SMITH, Corps of Engineers, U. S. A. 2-9-16

OFFICE OF THE LIGHT-HOUSE BOARD, Washington, D. C., February 24, 1893. Sealed proposals will be received at this office until 2 o'clock p. m. on Tuesday, the 14th day of March, 1893, for furnishing all the materials and labor of all kinds necessary for the construction and delivery of Light-Vessels Nos. 59, 60, 61, 62 and 63, for service on the great lakes, for a fixed sum or one or more vessels, or for an aggregate sum for all five vessels. The vessels are to be built of wood and are to be delivered to the Light-House Inspector at the Buoy Depot at Detroit Mich, or at St. Joseph, Mich., as may be directed. Forms of proposal, plans and specifications showing what is required, can be had or seen by applying to this offiee, or to the Light-House Inspectors at Portland, Me.; Boston, Mass., Tompkinsville, N. Y.; Philadelphia, Pa., Baltimore, Md., Buffalo, N. Y.; Detroit, Mich., or Chicago, Ill. The right is reserved to reject any or all bids and to waive any defects. JAMES A. GREER, Rear Admiral, U. S. N., Chairman. 2-9

UNITED STATES ENGINEERS OFFICE, Hickox Building, 185 Euclid Avenue, Cleveland, Ohio, February 26, 1893. Sealed proposals for dredging in Sandusky River, and at the harbors at Port Clinton, Huron and mouth of Black River, Ohio, will be received at this office until 2 o'clock. P. M., standard time, of Tuesday, March 28, 1893, and then publicly opened. Specificaiions, blank forms and all available information will be furnished on application to this office. JARED A. SMITH, Corps of Engineers, U. S. A. 2-9-16

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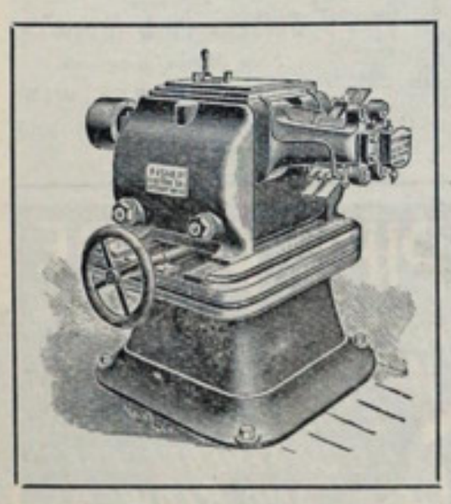

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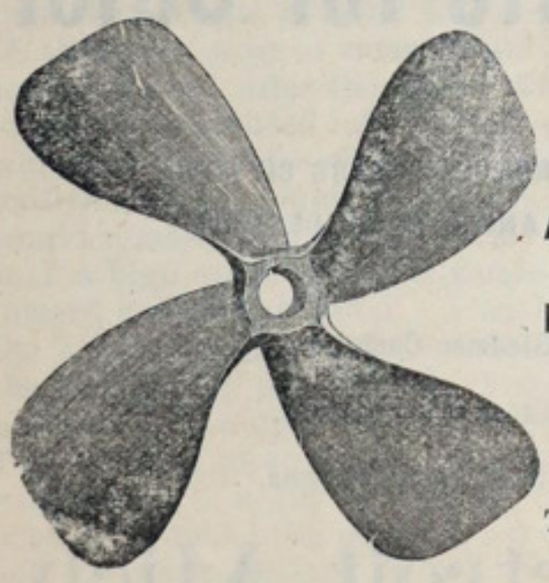

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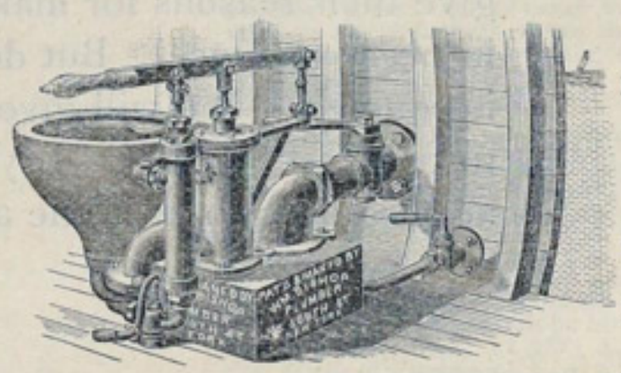

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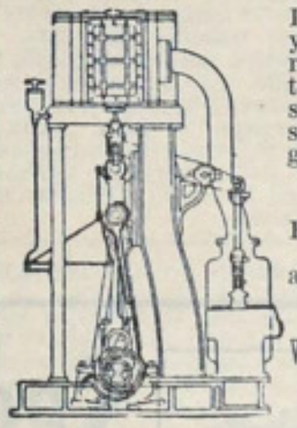

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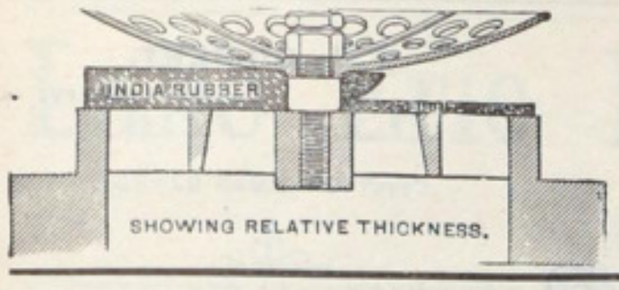

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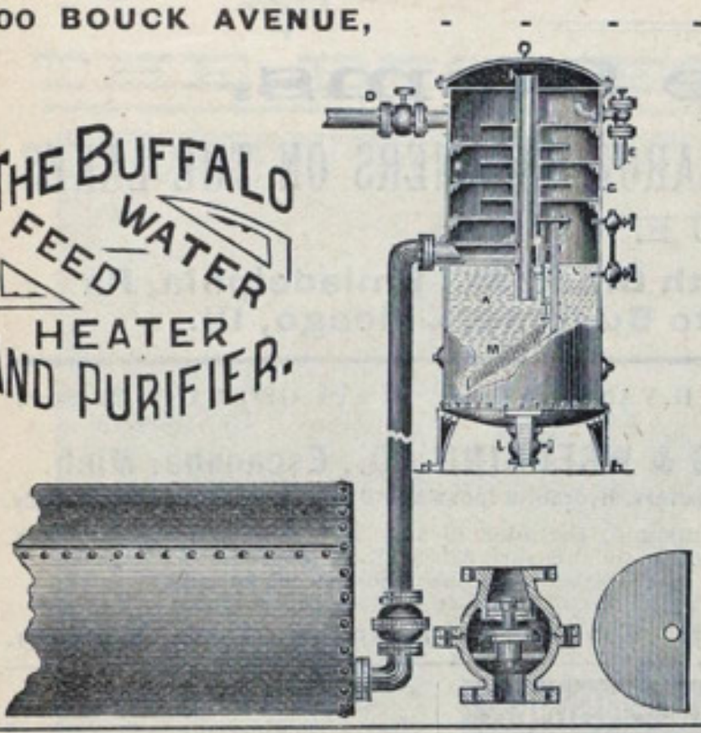

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B.—Boiler.
C.—Feed pipe to boiler.
D.—Steam pipe.
E.—Water supply pipe.
F.—Check valve.
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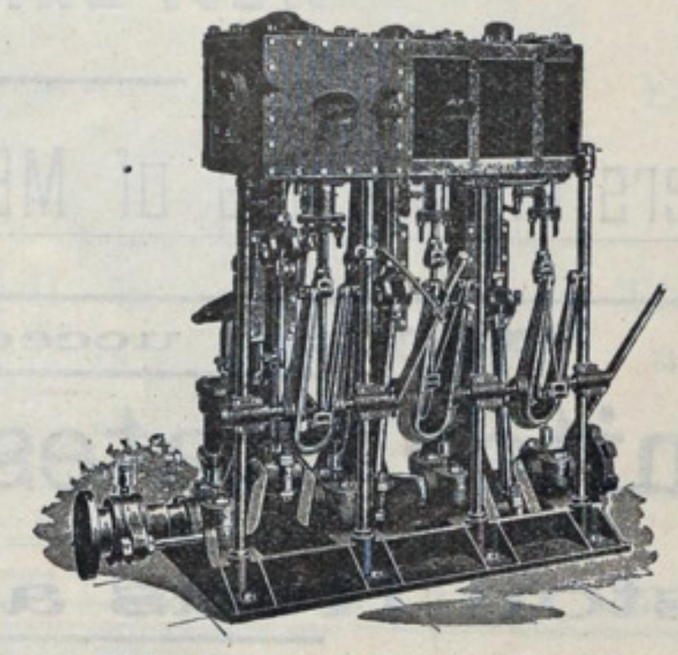

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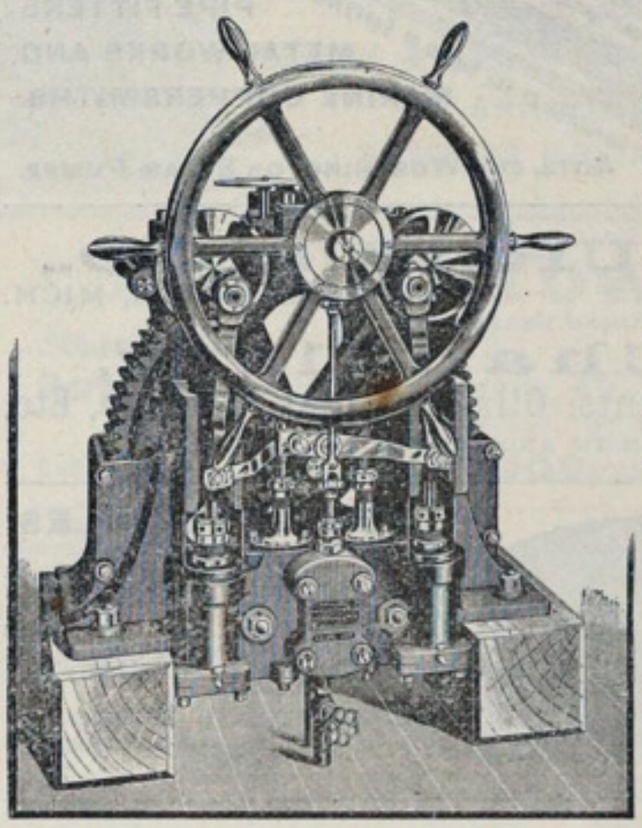

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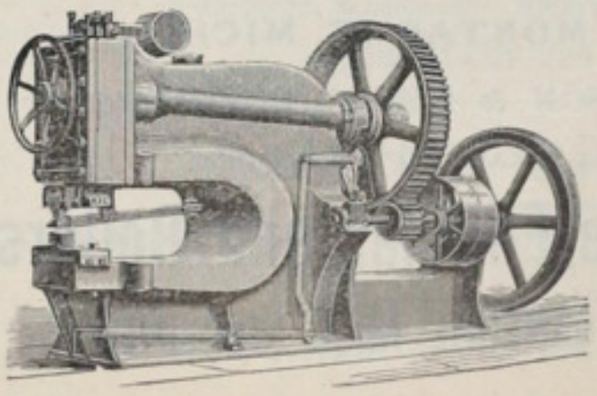

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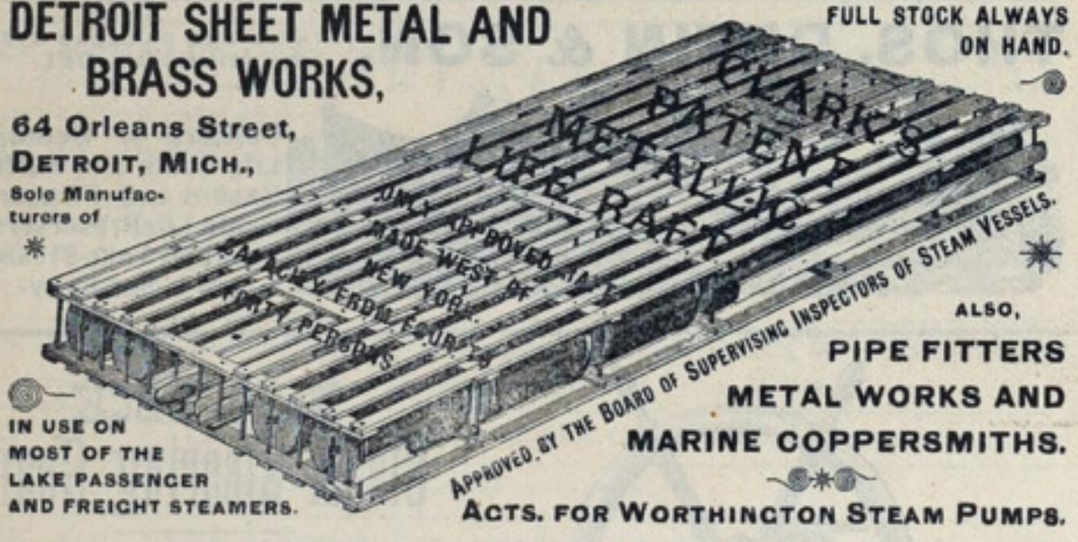
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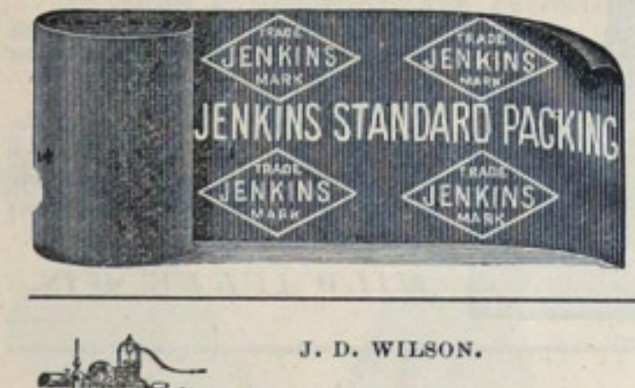

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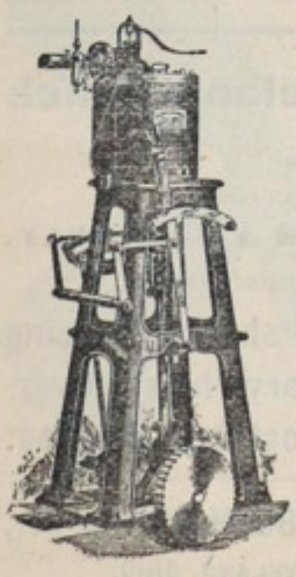

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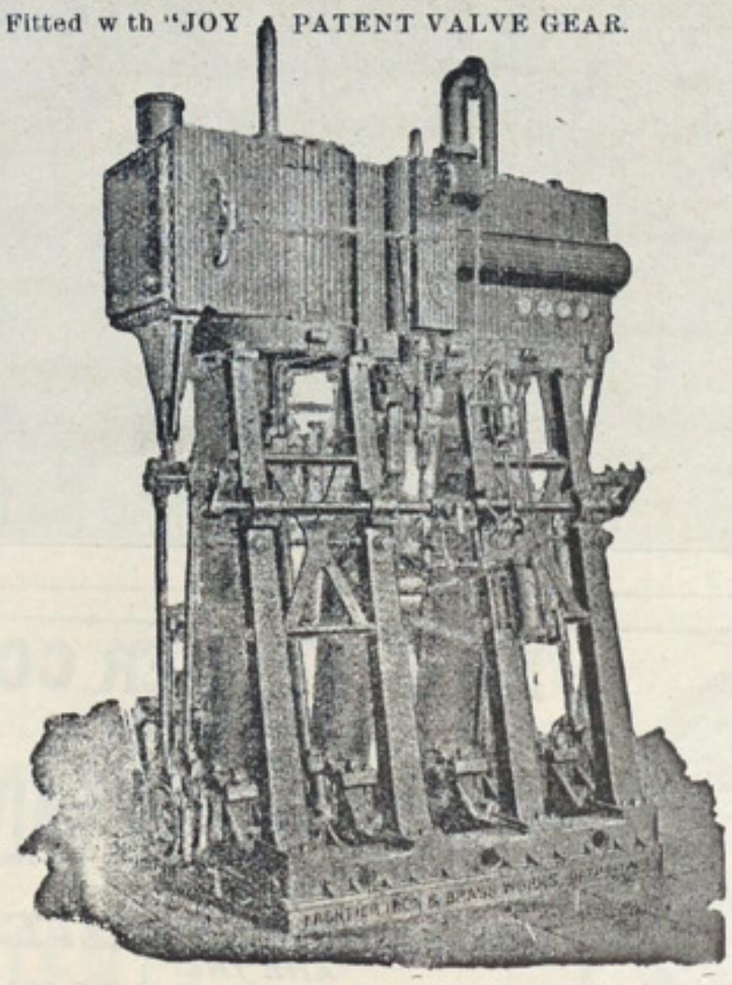

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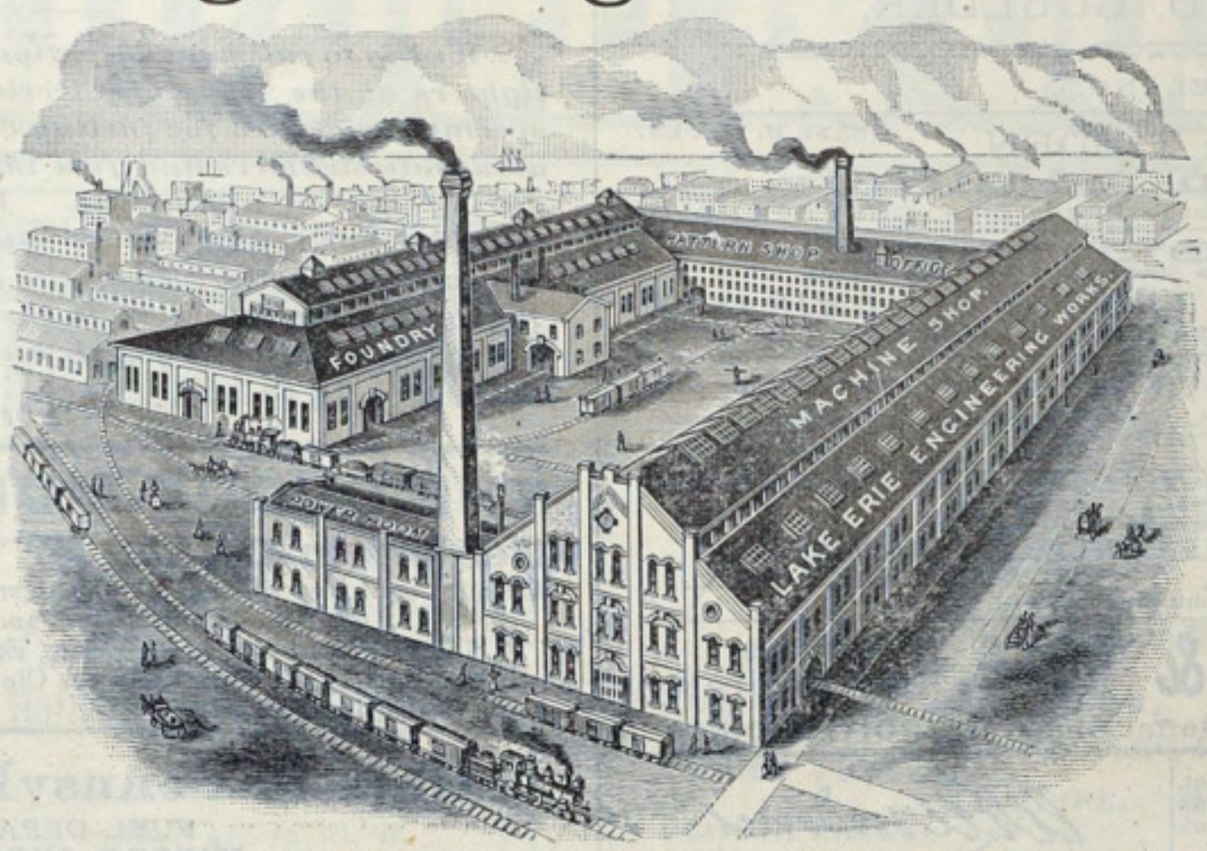

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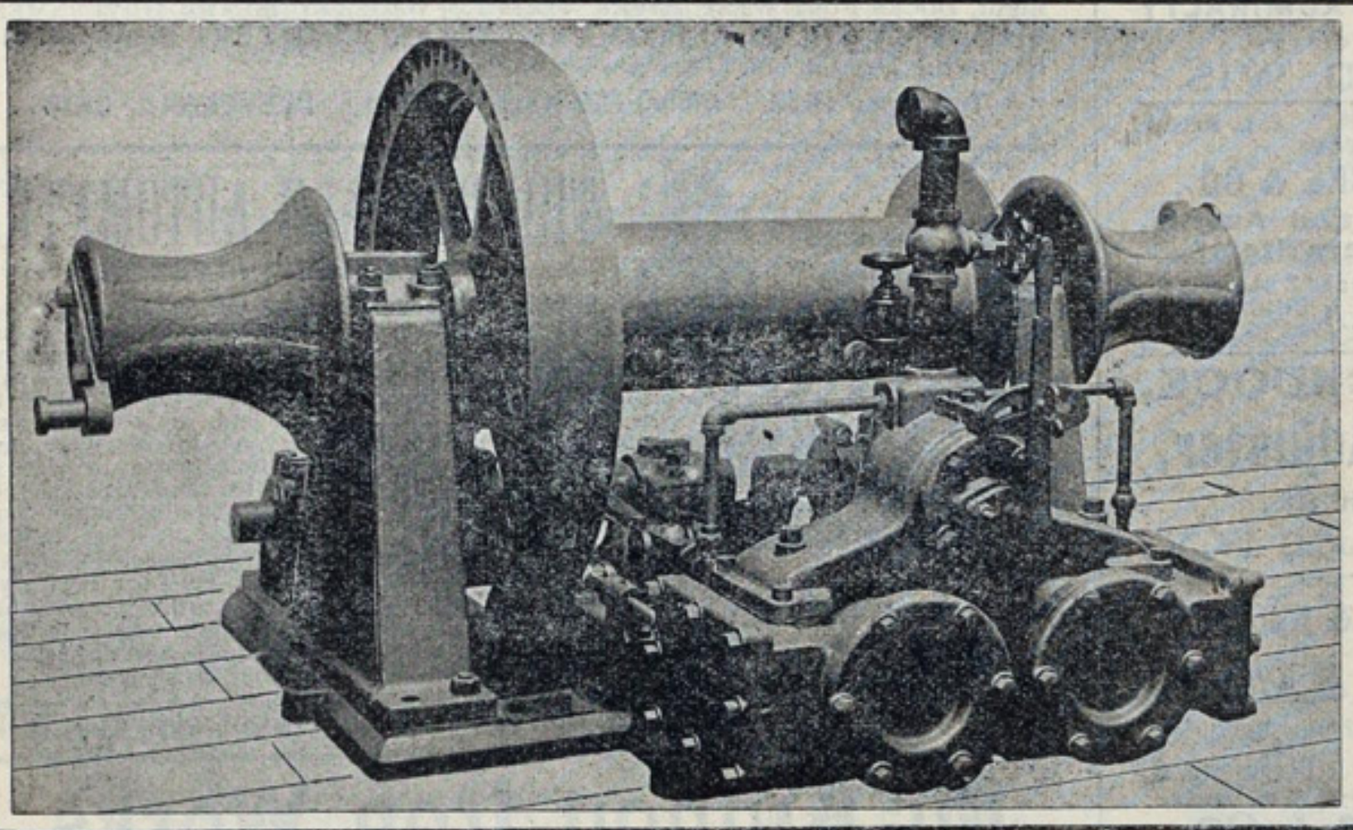

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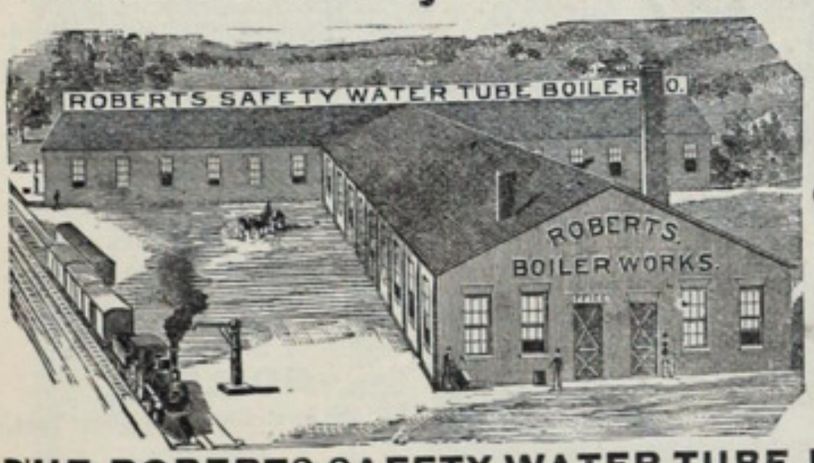

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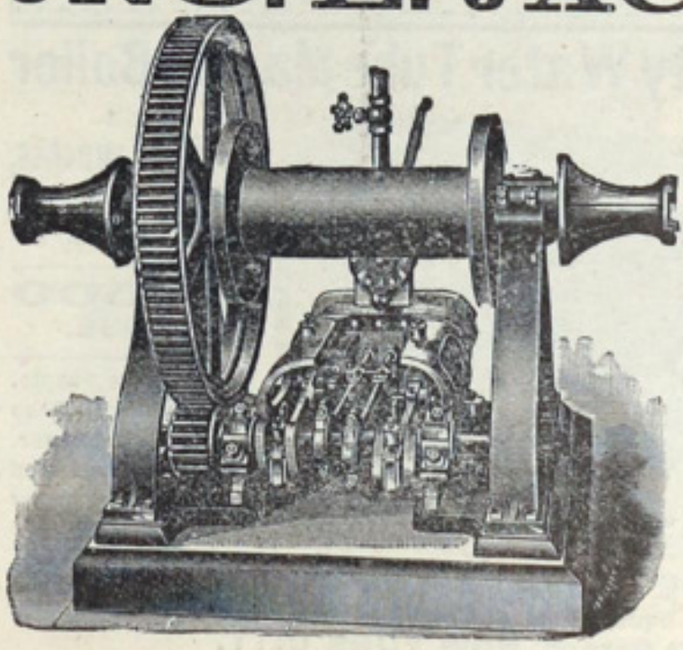

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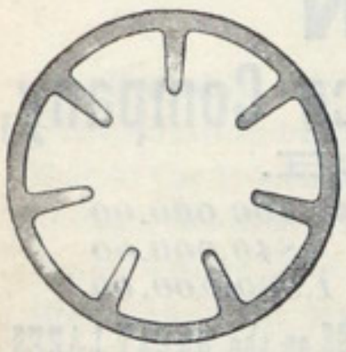

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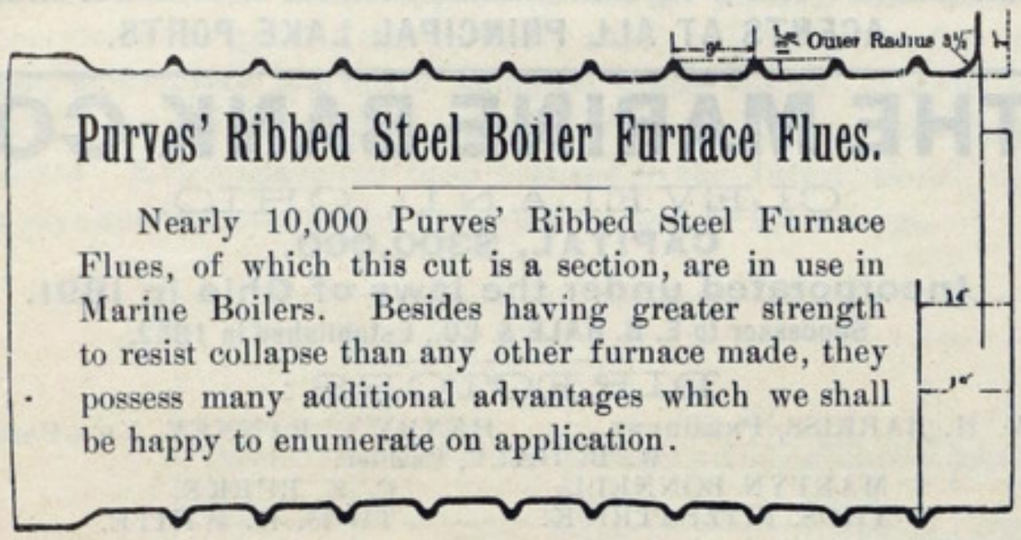

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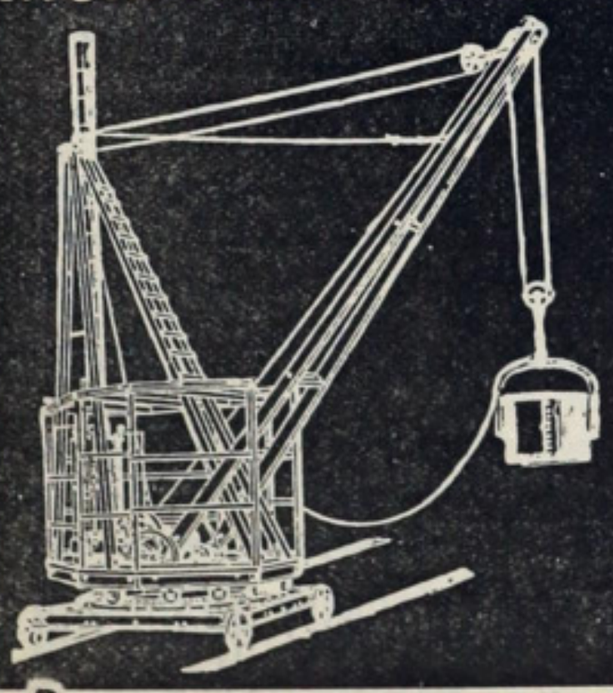

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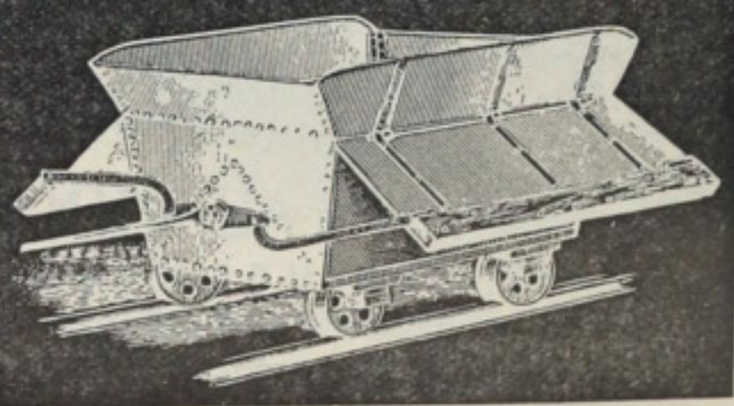

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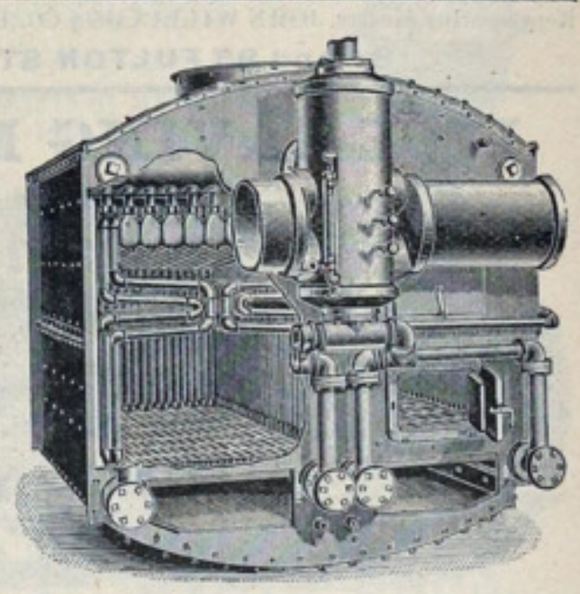

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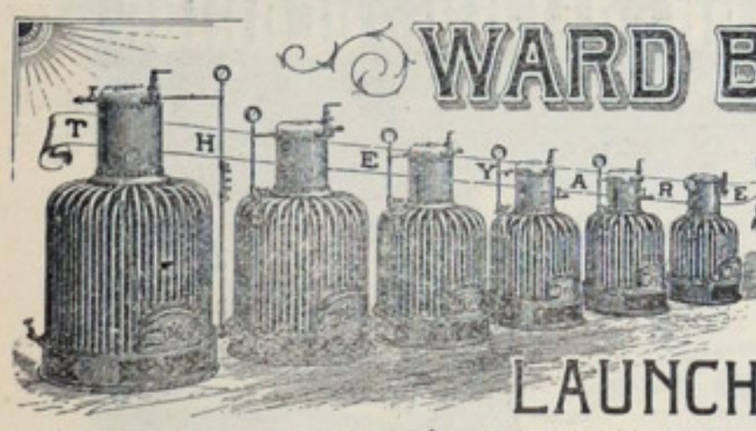

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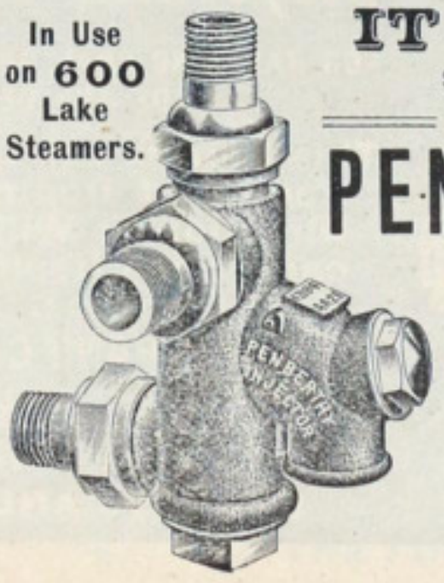

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